

High Line Canal
Mouth of South Platte River to confluence
with Second Creek
Denver
Denver County
Colorado

HAER No. CO-43

HAER
COLO
16-DENV,
64-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
Rocky Mountain Regional Office
National Park Service
P.O. Box 25287
Denver, Colorado 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

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NOTE: For shelving purposes at the Library of Congress, Denver vicinity in Denver County was selected as the "official" location for the High Line Canal. The canal is a 71-mile linear structure that is also located in Douglas County, Louviers vicinity, Arapahoe County, Littleton vicinity and Adams County, Commerce City vicinity.

Location: Linear feature extending 71 miles (including laterals) north-easterly from near the mouth of the South Platte River in Douglas County [Section 33, Township 6S, Range 69W]; intersecting Plum Creek [Section 29, Township 6S, Range 68W]; entering Arapahoe County [Section 33, Township 5S, Range 68W]; crossing Cherry Creek [Section 34, Township 4S, Range 67W]; ending at confluence with Second Creek; Denver County, Colorado.

Construction Date: 1879-83

Designer: Edwin S. Nettleton, Denver CO

Builder: Northern Colorado Irrigation Company, Denver CO

Present Owner: City of Denver, Board of Water Commissioners

Present Use: Irrigation canal

Significance: The first major irrigation project on the Front Range, the High Line Canal was the largest and most expensive canal ever built in Colorado before the advent of transmontane water diversion. Also called the "English" Canal because of the nationality of its original sponsors, the High Line project demonstrates the integral role of foreign investors in Colorado's development. Although it promoted settlement in and around the city of Denver during the late 19th century, the High Line Canal never achieved the success its investors had expected. Nevertheless, the canal is presently an important part of Denver's urban fabric.

Assembled by: John J. Roberts
Loveland Colorado

May 1994

The Historic American Engineering Record [HAER] documentation of the High Line Canal was conducted by Fraserdesign of Loveland, Colorado, under contract with Felsburg, Holt and Ullevig, Engineers. The documentation is intended to mitigate, in part, the impact on the canal by construction of a street across it in Douglas County, Colorado. Photographic recordation, research and preparation of this report were undertaken in April and May 1994. The research for this project involved five primary archival sources: the Western History Department at Denver Public Library, the Colorado State Historic Preservation Office, the Stephen L. Hart Library at the Colorado Historical Society and the Denver Board of Water Commissioners, all located in Denver, and the Morgan Library at Colorado State University in Fort Collins, Colorado.

Anglo explorers who ventured to the Rocky Mountains discovered extraordinarily different conditions from what they had known in the East. The Rocky Mountain West offered seemingly insurmountable obstacles to settlement, including hostile natives, sandy soils and rugged topography. Perhaps the feature most striking to explorers was the scarcity of water. Ubiquitous in the East, water was a precious resource in the American West, where many regions receive less than twenty inches of annual precipitation.¹ The arid or semi-arid climate prompted many potential settlers to declare the plains – from the Missouri River to the Rockies – inhospitable, better to “remain the unmolested haunt of the native hunter, the bison and the jackall [sic].”²

Nevertheless, 19th century explorers reconnoitered the West in increasing numbers, followed by prospectors in the 1860s and homesteaders in later years. Their arrival almost immediately precipitated serious disputes over use of the limited available water, indicating the need for a system to determine proper and just allocation.³ Colorado was first among the Western states to establish a legal framework for administering water rights. Based on the Prior Appropriation Doctrine (also known as the Doctrine of First-in-Time, First-in-Right), this framework employed a system of priorities in which time of appropriation determined the seniority of the water right. Those with older rights were entitled to their full appropriated amount of water before holders of more recent rights received any water. Nearly as important as the date of appropriation was that water be put to “beneficial use”. This customarily referred to employing water for domestic, agricultural, industrial and recreational uses, in order of respective priority.⁴

The Doctrine of Prior Appropriation, a western innovation, superseded an older system, the “Common Law” or Riparian Doctrine. Used in Europe and the eastern United States, the Riparian Doctrine granted landholders adjacent to a water source equitable rights to the water. Also known as the “Reasonable Use Theory,” the Riparian

Doctrine required users to avoid unreasonable use of water and harm to other users.⁵ The riparian system, unlike the prior appropriation framework, tied water rights to the adjoining land. In areas of plentiful water, reasonable use proved satisfactory. In Colorado, however, too little land contacted bodies of water for the system to be fair and effective. Colorado's first Session Laws in 1861 showed preference for the Riparian Doctrine. By the time Colorado achieved statehood fifteen years later, though, statutes and legal suits acknowledged only the Doctrine of Prior Appropriation, finding the Riparian Doctrine to be "totally inapplicable."⁶ The prominence of prior appropriation was manifest by its inclusion in the state's original Constitution:

The water of every natural stream, not heretofore appropriated, within the state of Colorado, is hereby declared to be the property of the public... The right to divert the unappropriated waters of any natural stream to beneficial uses shall never be denied. Priority of appropriation shall give the better right as between those using water for the same purpose.⁷

The constitution invested state water management policy with heretofore unexpressed authority. Two central premises are manifest in the document. First, the state claimed all water within its borders as public property. Second, although customary in Colorado since the first arrival of settlers, the doctrine of Prior Appropriation had legal merit. Governmental water regulation combined with the primacy of the Prior Appropriation Doctrine was from that time known as the "Colorado System".⁸

Although it wielded fundamental authority over water, the state failed in 1876 to regulate irrigation. Irrigators from around the region convened annually between 1873 and 1881 to lobby for enactment of pro-irrigation legislation. With few exceptions, the state heeded the irrigators' requests. Of particular significance was an act approved on March 5, 1881, that divided Colorado into water divisions and subsequent districts presided over by appointed commissioners. The legislation also established the office of State Engineer to supervise water claims.⁹ By the mid-1880s, the state had unprecedented authority over its water. Governmental water regulation rapidly prevailed in the West, spreading from Colorado to neighboring states.¹⁰

Farmers on the Eastern Slope and in the San Luis Valley relied heavily on diversion irrigation for water. The earliest water appropriation in the region was the San Luis People's Ditch, dating to April 10, 1852. Built by Mexican immigrants decades earlier, the ditch also qualifies as the oldest recorded irrigation canal in Colorado.¹¹ Several other canals were completed in the late 1850s and 1860s, increasing the state's total diversion capacity by about 700 cubic feet annually.¹² Some of the oldest irrigation ditches included the Guadalupe, Yeager, Big Thompson, Lower Boulder and Howell canals. These early ditches, according to the State Engineer, were:

...Irregular in section, fall and alignment. These channels were seldom carried above the highest level of the low bottom lands immediately joining the streams and usually wound around the toe of the slope of the high adjacent lands. From these humble constructions, with but a few square feet of cross-section, step by step, with the advent into the State of each increment of energy, skilled labor and wealth, Colorado has seen her irrigating canals multiply in numbers and with more and more perfection of construction, develop into great channels.¹³

Irrigation projects rapidly increased in size and number in the wake of the 1859 gold rush and the passage of the Homestead Act in 1862.¹⁴ Between 1873 and 1879, for instance, new ditch construction added about 1,380 cubic feet per second [cfs] to Colorado's canal capacity, raising it to about 2,700 cfs in 1879-84.¹⁵ The two most important 19th century canals, Denver's City Ditch and the Union Colony Ditch launched the state's most prolific period of canal-building - 1870 through 1900 - in which the most significant canals in Colorado history were constructed.¹⁶

Among these was the High Line Canal, so called because it follows the high line of gravity in its descent to the plains.¹⁷ The largest canal ever built in Colorado, its 84-mile length exceeded even the costly 20th-century transmontane projects such as the Colorado-Big Thompson Project [1938-47] and the Frying Pan-Arkansas Project [1964-82].¹⁸ The High Line's goal of supplying water to over 650,000 acres of eastern Colorado farmland promised to satisfy the needs of recent settlers. The extensive and highly touted project, however, ultimately failed to quench irrigators east of Denver, leading to financial loss by its investors. The canal's history provides a "window on western water," its ideals and realities.¹⁹

The notion of the High Line Canal (the spelling as a single word, Highline, represents modern usage) originated during the initial irrigators' convention in Denver, held in October 1873. Summoned by Territorial Governor Samuel H. Elbert, the convention petitioned Congress to pass laws fostering construction of irrigation systems in the West. The irrigators found vocal support from President Ulysses S. Grant. In his address to Congress on December 3, Grant advocated federal endorsement of western water interests. The president had visited Denver and Central City the preceding April, at which time he concocted an irrigation plan to promote settlement of the Colorado Territory. Grant's fantastic scheme entailed an irrigation ditch that extended from the South Platte to the Missouri River. Although impossible to accomplish, Grant's suggestion reflected a common view of aridity on the High Plains:

In this connection I would recommend the encouragement of a canal for the purpose of irrigating from the eastern slope of the Rocky Mountains to the Missouri River... Between the Missouri River and Rocky Mountains there is an arid belt of public land from 300 to 500 miles in width, perfectly valueless for occupancy of man for want of sufficient rain to secure the growth of any agricultural products.²⁰

Grant and others hoped to increase the value of the plains by creating productive cropland through irrigation. According to water historian James E. Sherow, they believed that irrigating the High Plains would "encourage settlement, increase economic production in the region, enlarge the tax base for state and local governments and provide the transcontinental railroads with something to haul."²¹ But Grant's monumental ditch was beyond the capacity of a federal government already stretched thin by Reconstruction and subsidies for railroad construction. Besides, the South Platte was incapable of sustaining such a lengthy canal, even assuming it could be supported by government or private investment. At the time of Grant's address, the High Line Canal was only an idea, but one with numerous proponents.

The first attempt at constructing the canal was undertaken three years after Grant's historic address. The Kansas Pacific Railroad Company [KP], like other railroads, hoped to develop its large tracts of western land grants. Land speculator Edward Reser saw an opportunity in KP's landholding. In 1876 he and a group of Denver businessmen incorporated the Colorado Irrigation Company for the purpose of building an irrigation system. After acquiring an option to develop 100,000 acres of KP land, the investors sought public support and underwriters to fund the project. When it was apparent that Colorado Irrigation was incapable of generating sufficient capital to build the canal by 1878, KP denied renewal of the company's option on the land, thereby ending the first bid at realizing the High Line Canal.

The second attempt was more successful. In the autumn of 1879, magnate Jay Gould began merging his Union Pacific Railroad Company [UP] with the Kansas Pacific. Believing irrigation of KP land in Colorado would attract settlers, Gould solicited financial support for a private irrigation venture. Two Englishmen, James Barclay and James Duff, were particularly interested in the project. Vice-presidents of the Colorado Mortgage and Investment Company [CM&I], Barclay and Duff had already become prominently known in Denver with their construction of the Windsor Hotel and other buildings.²² Further, CM&I was then the most prolific canal-builder in the state. In March 1879 CM&I organized the Larimer and Weld Irrigation Company to build the Eaton Ditch. A year later the company was involved with the High Line project east of Denver. And in January 1881 CM&I established the Loveland and Greeley Irrigation and Land Company to build a canal from the Big Thompson River.²³ The intricate business network of its English proprietors earned CM&I the nickname, the "English Company".

The English Company was historically noteworthy for two reasons. First, it built canals during the most productive period of irrigation development in the state. Civil engineer John E. Field has identified five periods of canal construction in Colorado, defined by the entities that funded and built them: individuals (circa 1864-70), cooperatives (1870-78), corporations (1878-84), state government (1884-1902) and

federal government (since the Reclamation Act of 1902). CM&I activity during the corporation period – which generated the most canals – surpassed those of rival firms.²⁴ Second, the Englishmen who managed CM&I exemplified the British element who frequented Colorado. Many ethnic groups comprised the state's population, principally Germans, Scandinavians, Canadians, Irish and Mexicans.²⁵ The English constituent was particularly conspicuous in Colorado and the West. This was attributable in part to the western climate – the same climate necessitating irrigation. "Colorado received higher praise for its climate than any other part of the West," according to one historian, "and it received more Englishmen."²⁶ The British were also attracted by aspects other than climate; the promise of successful cattle-ranching, farming, banking and mining drew throngs to Colorado, the "England beyond the Missouri".²⁷

In addition to its irrigation holdings, CM&I had invested heavily in downtown Denver real estate, railroad stock, cattle ranching, among other Western ventures. In October 1879 James Barclay returned to CM&I's base in London, where he and other investors established the Platte Valley Land Company which was to furnish CM&I with investment funds. CM&I incorporated a small company, Northern Colorado Irrigation [NCI], for the singular purpose of constructing the canal. While Barclay was in London, Duff agreed to buy 120,000 acres of UP-KP land adjacent to the South Platte River from its mouth sixty miles downstream.²⁸ When Gould's railroad merger was completed on January 24, 1880, the English Company commenced work on the High Line Canal.

Construction of the High Line Canal was coordinated by NCI, which awarded contracts to a series of local builders along the route. According to High Line Canal chronicler R.M. Pyle, "earth was first shifted on January 18, 1879," although the overall design was not finalized for more than a year.²⁹ By 1882 the High Line had advanced 44 miles to Cherry Creek, extending nearly 70 miles when completed in early 1883. The long-awaited canal opened unceremoniously with an announcement in the *Rocky Mountain News* of June 2, 1883: "Water was turned into the High Line ditch yesterday..."³⁰ By that time the High Line's construction had reached the staggering cost of \$652,000.³¹ Of the total expense, a substantial portion was attributed to construction of the headworks and other structures, including 3,123 feet of flumes and 216 feet of dams.³² Other expenditures included rebuilding the diversion dam, constructing the headworks, boring a tunnel, erecting five bridges and installing the many drops, siphons and wasteways.³³

When water first flowed through the canal in 1883, the High Line appeared to have been worth the enormous cost. Barclay and Duff had devised ways to increase the return on their investment while the ditch was under construction. First, the Platte Valley Land Company sold plots adjacent to the canal to likely farmers. Then NCI

sold "water right deeds," entitling bearers to the privilege of renting a specified amount of ditch water to irrigate a defined tract of land: 1.44 cfs for eighty acres. Additionally, a fee of \$1.75 per acre was charged in annual rent (\$1.50 on a few sections in Douglas County). NCI sold 31,000 acres of land with water rights and nearly 30,000 acres without water rights.³⁴ Assuming an adequate water supply, the irrigators' return could have been worthwhile. The quantity of water necessary to irrigate 31,000 acres, however, "wholly if not more than exhausted the capacity of the canal."³⁵

Despite the optimistic projections of its developers, NCI bore two principal handicaps: the unpredictable nature of the South Platte River and a weak water right. The water volume in the South Platte (designated with its tributaries Water Division Number 1) varied widely from month to month and year to year. Heavy mountain snowmelt during the spring and early summer swelled the river to – and sometimes over – its banks. In late summer and autumn, however, meager precipitation often left the South Platte perilously low. In 1888, for instance, the river's discharge was 140 cfs in late March, leaping to nearly 850 cfs in June and dwindling to 90 cfs by late September.³⁶ The Platte's unpredictability was widely known, as the State Engineer wrote in 1883:

After leaving the mountains [the South Platte and Arkansas Rivers] receive numerous tributaries on both banks, but these are all of one character, deep floods after heavy rainfalls, quickly subsiding to muddy streams during the wet season and drying up entirely for three-fourths of the year.³⁷

The river's impact on the High Line was striking: the annual amount of water diverted by the canal ranged from 6,000 to 90,000 acre-feet.³⁸ Without the means to impound the river and store water, such vacillation made the South Platte a precarious source for irrigation water.

Overappropriation, common on Colorado waterways, further burdened the flow of the river. In 1883, the High Line Canal received a provisional water right decree to divert 1,184 cfs from the South Platte. Dated January 18, 1879, the water right was subordinate to 74 other rights in Water District Number 8 and 111 rights in Water Division Number 1.³⁹ Drought years left canals such as the High Line with later-dated water rights with little, if any, water for their irrigators. In 1889, for example, NCI diverted only 43,400 acre-feet of water into the High Line Canal – only enough to irrigate 7,551 acres.⁴⁰

To exacerbate the English Company's problems, the High Line Canal suffered immediately from problems caused by poor design. In 1880 NCI hired prominent Colorado engineer Edwin S. Nettleton – then a candidate for the office of State Engineer – to design the

extensive project.⁴¹ Nettleton had established himself as a qualified water engineer, based upon his experience on the Union Colony irrigation system.⁴² His plan for the High Line, completed in February 1880, proposed a canal that began about a mile and a half up the Platte Canyon. The canal exited the canyon, wound northeasterly and crossed Plum Creek and the Atchison, Topeka and Santa Fe railroad tracks. Turning northward, the route proceeded east of Denver, crossed Cherry Creek and the UP-KP railroad tracks, and ended about ten miles beyond [see *Figures 1 and 2*].

The system consisted of three components: headworks, flumes and the ditch itself. The headwork, including the diversion dam, was the most substantial structure in the sprawling complex. The original diversion dam, destroyed by flooding soon after completion, was replaced by a new timber dam, 14 feet high and 124 feet long. Construction crews set the dam on solid bedrock between a granite wall of the mountain and sandstone masonry piers. The sluice gate releasing water into the canal opened sixteen feet wide. After passing through a 540-foot granite tunnel, the water immediately entered the first of three major flumes along the route. The canyon flume, a 2,600-foot-long, 20-foot-wide timber channel, rested directly on the ground. The second flume, over Plum Creek, was supported by 15-foot long pile bents over its entire 925-foot length.⁴³ Finally, the Cherry Creek flume, similar in design to the Plum Creek structure, stretched 825 feet.

Excavated using manual or horsedrawn labor, the earthen canal, "weak link of the system," varied widely in its dimensions.⁴⁴ It measured 40 feet wide and 7 feet deep over the first 46 miles, and 20 feet wide and 4 feet wide thereafter to its end. Nettleton stipulated that wooden drops be inserted at locations subject to severe erosion. Wooden stave pipe siphons carried water under creeks intersected by the canal.⁴⁵ Since their completion, the diversion dam and flumes have functioned properly as designed. The same, however, has not been true of the ditch.

Numerous design-related problems developed soon after the headgate was opened. Nettleton had planned the High Line to transport water through gravity. His prescribed grade (21 to 32 inches per mile) was too steep, however, causing the water to cut away the bottom of the ditch.⁴⁶ Abrupt curves allowed swiftly flowing water to erode and breach the outer banks of the canal. And the upper portions of the wall, thinner than the lower walls, were unable to endure much water without succumbing. Finally, the wooden drops and siphons deteriorated quickly under the force of water laden with silt and sand. Such flaws in design prevented diversion of more than 500-600 cfs, about 700 cfs less than the High Line's water right allowed.⁴⁷ The "beneficial use" provision of the Prior Appropriation Doctrine demanded that the High Line forfeit the right to water it did not use; by 1907 its water right had been reduced from 1,184 to 570 cfs.⁴⁸

PLAT OF
 PORTION OF WATER DISTRICT NO. 8,
 IN SOUTH PLATTE DIVISION (No. 1).
 STATE OF COLORADO.
 ISSUED FROM THE WATER ENGINEERING OFFICE, MINERALS BUILDING.

Original See Report of Water Commissioner John W. Gale.

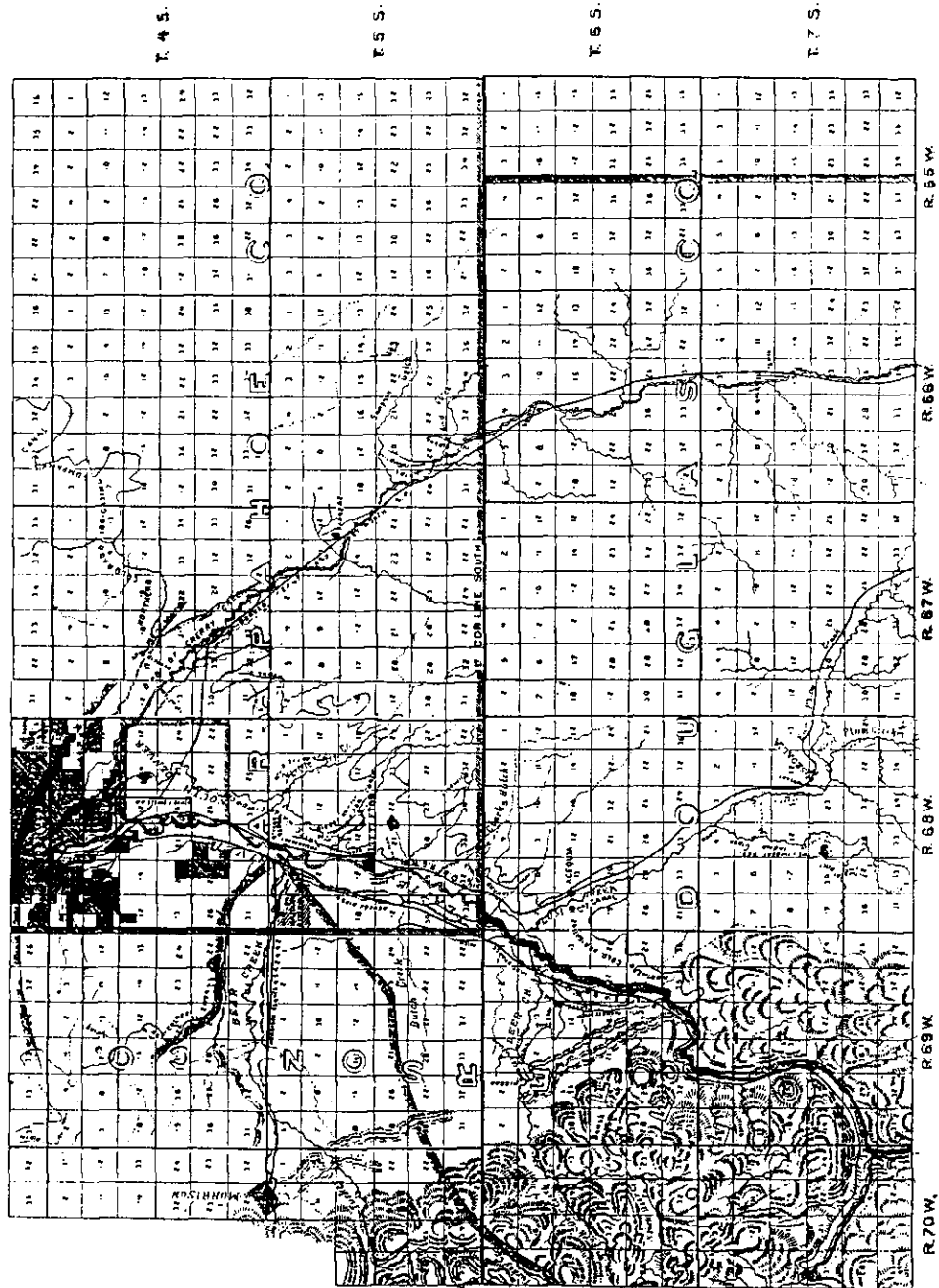


Figure 1. Map of High Line Canal and Water District No. 8, by Colorado State Engineer, 1889.

Secondary water rights and design flaws were only part of NCI's problem, as recurring drought caused more difficulties. Compounded with the canal's junior water right, droughts had the potential to leave the ditch and its customers completely dry. Every canal on the South Platte suffered during dry years, but few more than the High Line. Soon after opening the canal, NCI discovered the cost of maintaining the system far exceeded rental fee income. Barclay and Duff searched vigorously for ways to generate additional revenue. Their solution was to levy a surcharge in addition to the annual rent. Beginning in the mid-1880s, the English Company required irrigators to pay an extra \$10-30 per acre before receiving water.⁴⁹ The farmers along the canal, condemning the payment as a "royalty", vehemently opposed the new charge. The irrigation company soon found its royalty charge generating more problems than it solved.

NCI drafted contracts with the royalty clause and distributed them to its customers. Most signed the contract, but a few refused. Among those rejecting the charge was Denver physician and farmowner, Byron A. Wheeler. After he ignored the royalty payment, the company refused to deliver water. Wheeler responded immediately by petitioning the U.S. Supreme Court in early 1886 to grant a writ of mandamus, requiring NCI to supply water. The court refused to grant the writ because Wheeler had not followed the proper judiciary channel (his suit lacked "original jurisdiction" judgments from lower courts).⁵⁰ Wheeler then filed suit in Arapahoe County District Court in the spring of 1887. After extensive debate, Judge Victor A. Elliot decided in *Wheeler v. The Northern Colorado Irrigation Company* that the royalty was the legal prerogative of the company. Wheeler then appealed his case to the Colorado Supreme Court, which, in a ruling handed down on January 4, 1888, reversed the lower court's judgment. The high court's decree established a precedent for later water law: carriers of irrigation water are entitled to compensation for water carriage, but not to a charge for the consumers' right to use the water.⁵¹

Meanwhile, other irrigators battled royalty charges in a different venue. Aggravated by the royalty charges and reduced water levels, High Line customers formed the Farmer's Irrigation and Protective Association [FIPA] in January 1887. FIPA's first acts included filing suit against NCI and appointing a committee to draft a bill banning royalty surcharges for presentation at the next state legislative session. FIPA contended that NCI's royalty charge violated Sections 5 and 6 of the Colorado Constitution, claiming all water in the state as public property. Moreover, the farmers accused the English Company of "choking the life" out of Colorado irrigation interests.⁵² By the end of 1887 FIPA had won its litigation against the ditch company and had prompted the legislature to pass a law against royalty charges.⁵³ Wheeler's suit became the litmus test for the anti-royalty law, finally validating irrigators' right to receive water without paying unreasonable fees. NCI's final indignity occurred the next year as county commissioners exercised their authority to regulate water rates, reducing the rent on 17,000 acres to \$1.00 per acre, a net loss of nearly forty percent.⁵⁴

During the 1890s NCI was unable to provide sufficient water to its customers. Between 1889 and 1899 the High Line irrigated a maximum 12,316 acres of the 31,000 acres with water rights the Platte Land Company had sold.⁵⁵ With crops damaged by low water, angry irrigators began taking action against the ditch company. The first farmer to pursue NCI was David M. Richards. Richards, suffering crop failures since 1884, sued NCI in 1892. The district court ruled in his favor, awarding him restitution. Other farmers preferred more aggressive means. In 1901, a band of armed men opened the headgate of the High Line, ignoring the State Engineer's order to close it in favor of ditches with more senior rights. Identifying themselves as "Drye [sic] and Indigent [sic] Farmers," the men intended to keep the gate open, threatening to shoot anyone opposing them.⁵⁶ After coming to sword points, the State Engineer's office and the disgruntled farmers resolved the situation without violence.

The problem of low canal water was unequivocally the most detrimental to the success of the English Company and hundreds of farms. Poor administration accounted for a portion of the failure as well. Claims of mismanagement against the company multiplied in the wake of the legal and legislative conflicts of the 1890s. The friction apparently engendered an acrimonious relationship between the company and the community: "[The English Company] was disgusted with the treatment it received at the hands of the county commissioners, at the hands of the people and at the hands of the courts."⁵⁷ The actions taken against the company, however, were not without reasonable cause: NCI had promised water and sold water rights but had perennially failed to deliver sufficient water, except during years of extraordinary precipitation. A report drafted in 1917 by State Engineer Charles W. Comstock suggests that the English Company earned its inauspicious reputation through shoddy service: "That the water supply furnished by the High Line canal has always been inadequate and the service unsatisfactory are notorious facts."⁵⁸ Active citizens, tired of NCI's inaction, made attempts at securing a reliable water supply for the canal.

The ideal solution to the High Line's annual water deficit was construction of one or more storage reservoirs to impound spring runoff against the dry months of the summer irrigation season. Barclay and Duff recognized the need for a reservoir to supply their canal with water. "These same Englishmen, seeing, about 1886,... that these lands will never be irrigated from appropriations of the flowing Platte actually raised \$1,150,000 among themselves to construct a storage reservoir," stated *Denver Republican* reporter A.B. McKinley in 1907. "Adverse litigation, decisions of the court of Colorado,... etc., all combined to discourage the Englishmen, and the reservoir was never built."⁵⁹ The English Company's proposed reservoir collapsed under the pressure of the events of the late 1880s and early 1890s.

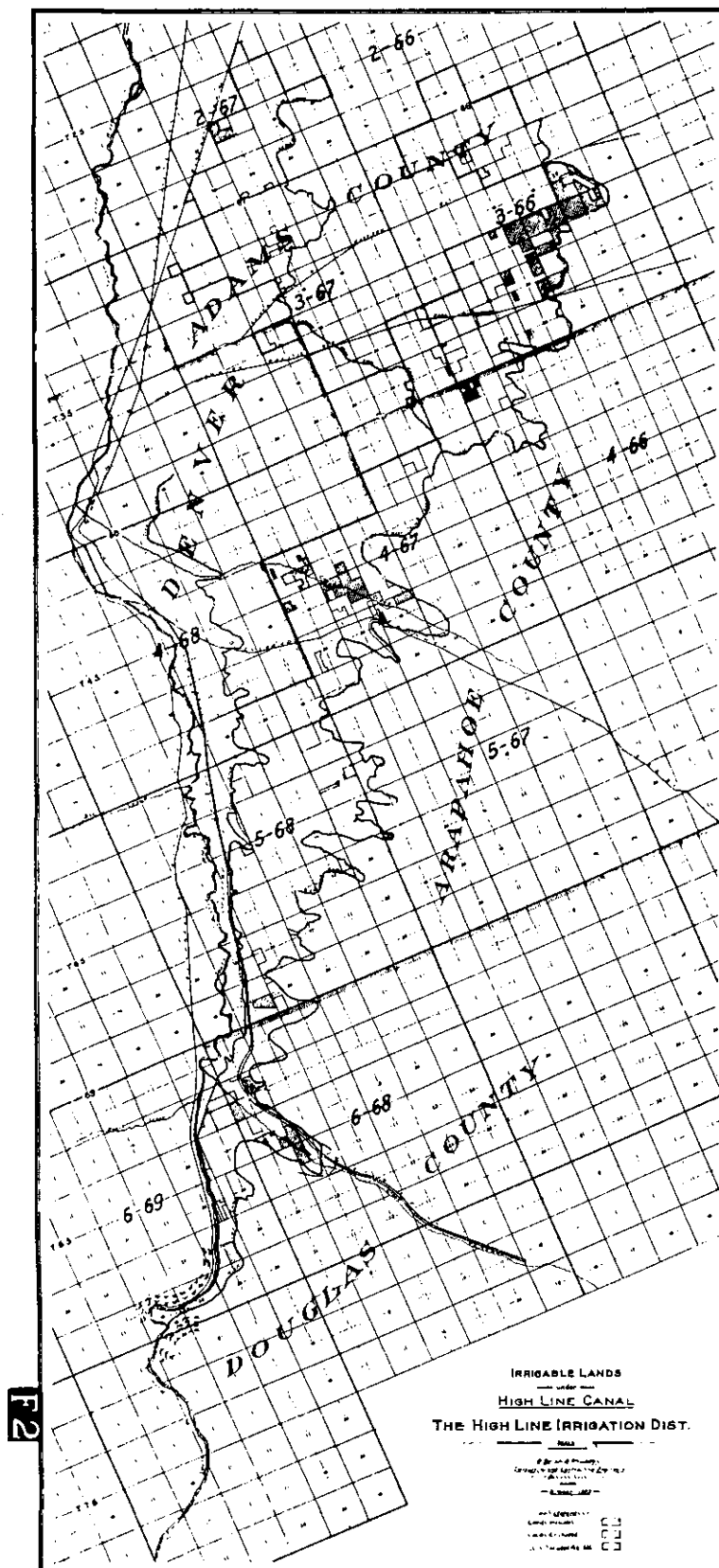


Figure 2. Map of High Line Canal and irrigable lands, by O'Brian & Rhoades, Consulting and Contracting Engineers, October 1903.

The exigent need for a storage dam, however, prompted several others to make attempts to build it. Acknowledging their need for a reservoir to supply water to the High Line, a group of farmers incorporated the High Line Reservoir Company in 1891, assessing themselves \$40 per acre to pay for construction of a dam on the upper reaches of the South Platte in Park County. The cooperative's aspirations never advanced beyond its early plans, however; the death of the company president and the Depression of 1893 doomed the enterprise.

A second attempt, also futile, was initiated in 1892. Denver attorney Cyrus Richardson formed the High Line Reservoir Company (separate from the farmers' organization). He procured the Antero and Lost Park damsites on the South Platte, located about six miles above Hartsel, Colorado. Richardson proposed to sell water from his planned reservoir and organize a new irrigation district on his land east of Denver. Although construction began in 1892, it ended abruptly when Richardson died the next year.⁶⁰

After the turn of the century, the High Line Canal continued to disappoint its users.⁶¹ "The English ditch was blunder twenty years ago," the *Denver Times* stated frankly in 1902.⁶² To rectify the problem, several investors, including some from CM&I, formed the High Line Ditch Company in 1903 for the purpose of purchasing the Antero and Lost Park sites, building a storage dam and creating a new water district. The company proposed raising \$1.1 million in bonds, to be paid by the irrigators.⁶³ Included in the bonds would be the purchase of the High Line Canal for \$375,000 and construction of a \$725,000 dam and reservoir below the Cheesman Dam (under construction, 1900-05). To repay the bonds, each irrigator would be subject to an annual tax increase of \$70 per acre.⁶⁴

The company had popular support, but concerned parties, led by Denver attorney and former senator A.B. McKinley, doubted the project's feasibility. An associate of the late James Duff and James Barclay, McKinley challenged the legality of the project. He believed irrigators would be dissatisfied with the volume of water the storage reservoir would provide. McKinley filed suit against the company in 1903, initiating an aggressive four-year legal campaign. The court decision, finally handed down the first week of April 1907, found the bond issue invalid and refused to sanction the new district.⁶⁵

McKinley then became one of the reservoir's main promoters. During the summer of 1907, he and others advanced the High Line Improvement Fund, a scheme to finance improvements to the High Line Canal system. McKinley had the broad support of Denver capitalists and civic leaders. David H. Moffat, for instance, donated \$2,000,

and Denver Mayor Robert W. Speer championed "McKinley's pet scheme."⁶⁶ But McKinley and his associates soon faced competition in expanding the High Line system. In September 1907 Horace G. Clark, leading a coalition of Denver and Greeley investors, paid the widow of Cyrus Richardson \$50,000 for the assets of the High Line Reservoir Company. Within a month, Clark's syndicate formed the Antero and Lost Park Reservoir Company, buttressed by about \$2 million in capital. Clark and his partners prepared to impound the Antero Reservoir and lengthen the High Line Canal.⁶⁷ The Antero Company, to the exclusion of McKinley and his associates, became the foremost promoter of the reservoir.

Several activities occupied the Antero Company over the following years. First, Clark employed Field, Fellows and Hinderlider, a Denver water engineering firm, to evaluate the cost of rehabilitating and modernizing the old High Line Canal. Two reports in late 1907 concluded that the canal required extensive repair and replacement of the major structures along its route. Antero also bought Platte Land's unirrigated parcels in 1907. The dam was completed in 1909, water flowing through its outlet on July 16.⁶⁸ All that remained for the Antero Company's success was acquiring the canal. English control over the High Line Canal ended with the Antero Company's purchase of Northern Colorado Irrigation for \$600,000 in October 1910. "Then, leaving behind the High Line and their failed responsibility for filling it, yet well watered with profits," wrote Robert Pyle, "Barclay's men skipped town for the green and pleasant land whence they'd come, where water wasn't a problem."⁶⁹

The Antero Reservoir, the highly touted solution to the High Line's woes, offered farmers reason for hope. The canal's inherent design flaws, though, still needed to be corrected. In addition, the company intended to expand the irrigable acreage to 60,000 by constructing an extension canal. The entire project called for a dramatically increased flow in the High Line Canal, but the canal could not then support more water without more than \$500,000 in improvements. Clark intended to pay for these improvements by issuing bonds. When the company was unable to sell the bonds, however, Clark approached Denver utilities magnate Henry L. Doherty in late 1912 for support. In January 1913 Doherty and Company agreed to underwrite the bond issue and direct reconstruction of the canal.⁷⁰

By March work had begun on what came to be called "Doherty's Ditch." A fierce conflict between Clark and Doherty over details of construction, however, prevented the ditch's completion. On August 31, 1915, Clark, tiring of the struggle, sold NCI, the High Line Canal (with Doherty's Ditch) and Antero Reservoir to the City of Denver Public Utilities Commission for \$1.05 million.⁷¹ After years of litigation between

Doherty and Company and the city, Denver took possession of the canal system in June 1924. Nine years, however, had a pernicious effect on the canal's condition. By the time the sale was complete, the canal was in "exceedingly poor repair," forcing a reduction of the purchase price.⁷²

After Denver acquired NCI, the ditch increasingly came to serve municipal needs. Most of the farmers who once relied on the High Line to irrigate their crops had either abandoned their land or learned dry-farming techniques. Through gradual attrition of laterals, the canal system had withered to its current 71-mile length. Although reduced by some 15 miles, the High Line continues to be the largest in Water District Number 8 and one of the largest statewide.⁷³ The canal has contributed pivotally to Denver's expansion. The city's population had dramatically grown from about 5,000 people in 1870 to almost 36,000 in 1880. Twenty years later that number exploded to over 140,000. On its way to a quarter of a million people by 1920, the city overtook the surrounding area.⁷⁴ With population growth and eastward expansion came a greater demand for water, and one of the obvious sources for this was the High Line Canal.

Several years of contention between irrigators and the newest management highlighted the period following 1924. Soon after the Public Utilities Commission – forerunner of the Denver Board of Water Commissioners – assumed management of the canal, it aggravated the traditionally conservative and volatile High Line irrigators. In 1925 the Water Board raised the annual rent from \$1.50 and \$1.75 per acre to \$2.25 an acre and released only a small volume of water from the Antero Reservoir, though it was nearly full. Irrigators, hardened by perpetual conflict with canal management, acted quickly to restore the old rates. Several farmers and businessmen with vested interests in the canal formed the High Line and Antero Reservoir Association. Confronted with little progress, the association diminished in numbers and efficiency within a few years. The irrigators, "a very dissatisfied bunch of water right owners," by 1935 finally had no recourse but to accept the elevated charges.⁷⁵

In 1938 the Denver Water Board assumed control of the High Line Canal itself, thereby terminating the Northern Colorado Irrigation Company. Currently, 150 water-rights holders benefit from the canal. Among the more important of these are Englewoods' McClellan Reservoir, Skeel Reservoir, Fitzsimons Army Hospital, Windsor Lake (at the historic Fairmount Cemetery) and Derby Lake at the Rocky Mountain Arsenal.⁷⁶ The High Line, a longstanding urban landmark, has in recent years become a focus of recreational activities. A maintenance road along a portion of its length has become a recreational trail popular among walkers, runners, bikers, cross-country skiers and horseback riders. The Denver South Suburban Recreation and Park District, maintaining a stretch of the trail about 19 miles long from County Line Road to Hampden Avenue, indicates approximately 76,000 people use the trail annually.⁷⁷

Western water history is littered with aborted irrigation schemes, calamitous dam failures, ditches gone dry and litigation seemingly without end. The High Line Canal, completed in 1883 after ten years of planning, has over much of its existence threatened to be one of the countless casualties of the water wars. Flawed in its conception, design and management, it was widely regarded as a technological and financial failure for decades – the source of longstanding frustration for the farmers it served and disappointment for the investors who sought to profit from it. In this the canal is painfully representative of Colorado's agricultural development. Nevertheless, the High Line Canal has continued to play a pivotal role in Denver's development for over 100 years, due in large part to the project's scale and importance. It is the longest irrigation ditch in Colorado, rivaling even the 20th-century federal reclamation projects. In a larger context, the canal has contributed vitally to the development and growth of Denver and the Front Range during a crucial stage of the area's settlement. Representing in microcosm the unique nature of the West, the High Line Canal has formed an integral part of Denver's water system – a significant part of the city's heritage.

Endnotes

¹ G.E. Radosевич, K.C. Nobe, D. Allardice and C. Kirkwood, *Evolution of Colorado Water Law: 1876-1976* (Fort Collins: Water Resources Publications, 1976), p. 1.

² Carl Ubbelohde, Maxine Benson, and Duane A. Smith, ed., *A Colorado History* (Boulder: Pruett Publishing Company, 1972; reprinted 1976 and 1982), p. 30.

³ Many of the first irrigators in Colorado, because they came from regions of unfailing springs and streams, believed the water supply in the West to be "inexhaustible." Alvin T. Steinel, *History of Agriculture in Colorado, 1858 to 1926* (Fort Collins: Colorado Agricultural College, 1926), p. 187.

⁴ Several legal characteristics distinguish the Doctrine of Prior Appropriation. First, a water right under this doctrine stipulates a specific quantity of water, usually measured in acre-feet or cubic feet per second (cfs) (one cfs is the equivalent of about 651,000 gallons). Second, a water right is a vested and real property holding. It may be bought, sold and inherited, its value being based on the seniority of the right. Third, land ownership is not a prerequisite to obtaining a water right. Finally, a claim

to a new water right may be made on unappropriated water. In Colorado, however, most accessible water sources are overappropriated, with insufficient water to fill all existing applicable water rights.

⁵ Radosevich, pp. 16-18.

⁶ *Fourth Biennial Report of the State Engineer to the Governor of Colorado for the Years 1887 and 1888*, part 1 (Denver: The Collier and Cleaveland Lithographic Company, 1889), p. 22.

⁷ Article XVI, Sections 5 and 6, *Constitution of the State of Colorado*, 1876, quoted in *Biennial Report of the State Engineer for the Fiscal Years 1881 and 1882* (Denver: Tribune Publishing Company, 1882), p. 6.

⁸ Robert G. Dunbar, "The Origins of the Colorado System of Water-Right Control," *Colorado Magazine* 27 (October 1950), p. 241.

⁹ Sections 1-5 address the establishment of water districts and Sections 6-12 detail the responsibilities of the State Engineer; the act is reproduced in its entirety in the *Biennial Report of the State Engineer for the Fiscal Years 1881 and 1882* (Denver: Tribune Publishing Company, State Printers, 1882), pp. 13-16.

¹⁰ Ubbelohde, p. 200.

¹¹ Steinel, p. 177.

¹² *Third Biennial Report of the State Engineer to the Governor of Colorado for the Years 1883 and 1884* (Denver: The Times Company, 1885), p. 23.

¹³ *Fourth Biennial Report*, p. 17.

¹⁴ Between spring 1859 and June 1861, at least 19 canals were constructed on the Platte and Arkansas River systems. Wilbur Fiske Stone, ed., *History of Colorado*, volume I (Chicago: The S.J. Clarke Publishing Company, 1918), pp. 492-93.

¹⁵ *Third Biennial Report*, p. 23.

¹⁶ *Report of the State Engineer to the Governor of Colorado for the Years 1883 and 1884* (Denver: The Times Company, 1885), pp. 211-12.

¹⁷ Frances Melrose, "Drought Left Canal Backers Dry," *Rocky Mountain News*, 22 March 1992.

¹⁸ Carl Abbot, Stephen J. Leonard, and David McComb, *Colorado: A History of the Centennial State*, revised (Boulder: Colorado Associated University Press, 1982), p. 179.

¹⁹ Robert Michael Pyle, *The Thunder Tree: Lessons from an Urban Wildland* (Boston: Houghton Mifflin Company, 1993), p. 54.

²⁰ Steinel, p. 193.

²¹ James E. Sherow, "Watering the Plains: An Early History of Denver's Highline Canal," *Colorado Heritage* (November 1988): 2.

²² Louisa Ward Arps, *Denver in Slices* (Denver: Sage Books, 1959), pp. 24, 142.

²³ Dunbar, "Origins," p. 258.

²⁴ John E. Field, "Development of Irrigation," in Stone, pp. 492-96; see also Michael Creed Hinderlider, "Historical Sketch of Irrigation Development in Colorado," in *Twenty-third Biennial Report of the State Engineer to the Governor of Colorado for the Years 1925-1926* (Denver: Bradford-Robinson Printing Company, 1927), pp. 14-17.

²⁵ Abbot, p. 188.

²⁶ Robert G. Athearn, *Westward the Briton* (New York: Charles Scribner's Sons, 1953), p. 118.

²⁷ *Ibid.*, p. 125.

²⁸ "The High Line Irrigating Canal," *Rocky Mountain News*, 1 November 1879.

²⁹ Pyle, p. 66. "Mr. E.S. Nettleton, the engineer in charge, is now busy in making the final location of the route, and preparing plans for contractors," "The High Line Canal," *Rocky Mountain News*, 1 February 1880.

³⁰ "Water Turned On," *Rocky Mountain News*, 2 June 1883.

³¹ Expensive building materials and inefficient transportation forced the cost of the High Line more than \$200,000 over what it would have cost in 1907, Field, Fellows, and Hinderlider, p. 7.

³² Mosley, p. 122.

³³ "The High Line Canal," *Rocky Mountain News*.

³⁴ Steven F. Mehls, "Highline Extension Canal System," Historic American Engineering Record, HAER No. CO-67, March 1992, p. 5.

³⁵ Field, Fellows and Hinderlider, "Report on the (English) High Line Canal System," 19 October 1907, Michael Creed Hinderlider Collection, Stephen H. Hart Library, Colorado Historical Society, Denver, Colorado, p. 8.

³⁶ Data taken from *Fourth Biennial Report, 1887 and 1888*, part II.

³⁷ *Report of the Stote Engineer, 1883 and 1884*, p. 11.

³⁸ Comstock, pp. 4-5.

³⁹ Earl L. Mosley, "History of the Denver Water System" (Denver: Denver Board of Water Commissioners [typewritten]), pp. 116, 125; *Fourth Biennial Report of the Stote Engineer to the Governor of Colorado for the Years 1887 and 1888*, part I (Denver: The Collier and Cleaveland Lithographic Company, State Printers, 1889), p. 215; *Report of the Stote Engineer to the Governor of Colorado for the Years 1883 and 1884* (Denver: The Times Company, State Printers, 1885), Table VIII, p. 53.

⁴⁰ Data from table in Field, Fellows, and Hinderlider, p. 13.

⁴¹ Dunbar, "Origins," p. 260. Eugene K. Stimson was the first State Engineer (1881-83), in place of Nettleton, who was prevented from the job because of his involvement with the High Line project. Nettleton succeeded Stimson as State Engineer for the years 1883-1887. See "List of Officials in Charge of Water Distribution," *Eighteenth Biennial Report of the Stote Engineer to the Governor of Colorado for the Years 1915-1916* (Denver: Eames Brothers, State Printers, 1916), p. 4.

⁴² Mehls, p. 5.

⁴³ Technical description of canal and related structures from Field, Fellows, and Hinderlider, pp. 3-6.

⁴⁴ Sherow, p. 8.

⁴⁵ Field, Fellows, and Hinderlider, p. 5.

⁴⁶ Grade and dimensions of canal from Pyle, p. 67.

⁴⁷ Details of design flaws in Sherow, p. 8.

⁴⁸ Field, Fellows, and Hinderlider, p. 28.

⁴⁹ A surcharge for the "perpetual right" to use canal water was a common practice among irrigation companies; within Colorado, the charges ranged from \$5 to \$15. Robert G. Dunbar, *Forging New Rights in Western Woters* (Lincoln: University of Nebraska Press, 1983), p. 25.

⁵⁰ Steinel, p. 207.

⁵¹ Mosley, p. 125.

⁵² Dunbar, *Water Rights*, p. 26.

⁵³ *Ibid.*, pp. 25-26.

⁵⁴ Sherow, p. 11. The Colorado Constitution of 1876 empowered county officials with regulating ditch company rates, discussed in Abbot, p. 165.

⁵⁵ Denver Board of Water Commissioners, "South Platte River Investigation," volume IV, Table CI, June 1926, Engineering Records, case K, shelf 2, number 4.

⁵⁶ Sherow, p. 9.

⁵⁷ "The High Line, or English, Ditch May Go Dry Shortly," *Denver Times*, 26 May 1902.

⁵⁸ Charles W. Comstock, "The High Line Canal and the Antero Reservoir," August 1917, Western History Department, Denver Public Library (typewritten), p. 6.

⁵⁹ A.B. McKinley, "Need of Big Reservoir on the Upper Bend of the Platte," *Denver Republicon*, 7 April 1907.

⁶⁰ Paul D. Friedman, "Historic Properties Preservation Plan for the new Denver International Airport, Denver County, Colorado," 14 September 1990, New Denver Airport Office, Stapleton International Airport, Denver, Colorado.

⁶¹ An expression of farmers' attitudes about the High Line Canal in 1906 is found in William Scott Lee, "Give Even the Devil his Due," *Denver Times*, 1 July 1906.

⁶² "A profound mistake was made in not first ascertaining that the water of the Platte river was all appropriated. In order to help the ditch out after it was constructed the legislature passed a law requiring the old ditch owners, who claimed an indefinite amount of water, to affirmatively prove the original appropriation of the quantities they claimed. It was expected by the friends of the ditch company, and by the owners of the land under the ditch, that these old ditch owners would fail to prove the appropriation of three-quarters of the water they claimed and that thus enough would be left unappropriated to adequately supply the English ditch. But

contrary to expectations the old-timers proved that the entire river was theirs. Logically, not a drop of water was left for the ditch." "The High Line, or English, Ditch May Go Dry Shortly," *Denver Times*, 26 May 1902.

⁶³ Mehls, pp. 6-7.

⁶⁴ McKinley, "Need of Big Reservoir," *Denver Republicon*.

⁶⁵ Ibid.

⁶⁶ "Work to Make Denver Bloom," *Denver Republic*, 21 August 1907.

⁶⁷ The Highline Extension Canal has been documented by Steven Mehls for the Historic American Engineering Record, HAER No. CO-67.

⁶⁸ *Fifteenth Biennial Report of the State Engineer to the Governor of Colorado for the Years 1909-10* (Denver: The Smith-Brooks Printing Company, 1911), p. 179.

⁶⁹ Pyle, p. 69.

⁷⁰ "Sale of Antero Project to Bring 3,000 Families, Millions in Cash, Here," 6 January 1913, *Denver Republicon*.

⁷¹ Denver Water Consumers League to the Denver Utilities Commission, 11 September 1915, quoted in Mosley, pp. 54-56; comprehensive summation of the sale and litigation surrounding the High Line Canal and Antero Reservoir in "The Antero Case: Opinion of the Supreme Court of Colorado" *Denver Post*, 19 January 1921.

⁷² A.D. Wall to E.G. Plowman, 11 October 1933, Engineering Records, Denver Board of Water Commissioners, Drawer 59, No. 1-31.

⁷³ Several later canals, unencumbered by the High Line's obstacles, divert a greater water volume: Fort Lyon, 933 cf; Empire, 667 cf; and Rio Grande, 912 cf, for example, *Fifteenth Annual Report*, pp. 69-71.

⁷⁴ Abbot, p. 355.

⁷⁵ Summary of the Denver Water Board's management and quote in Wall to Plowman, pp. 3-4.

⁷⁶ Melrose, "Drought."

⁷⁷ Kathye Thomas, "Highline Bypasses Big City's Bustle," *Littleton Sentinel*, 6 May 1981, p. 6.

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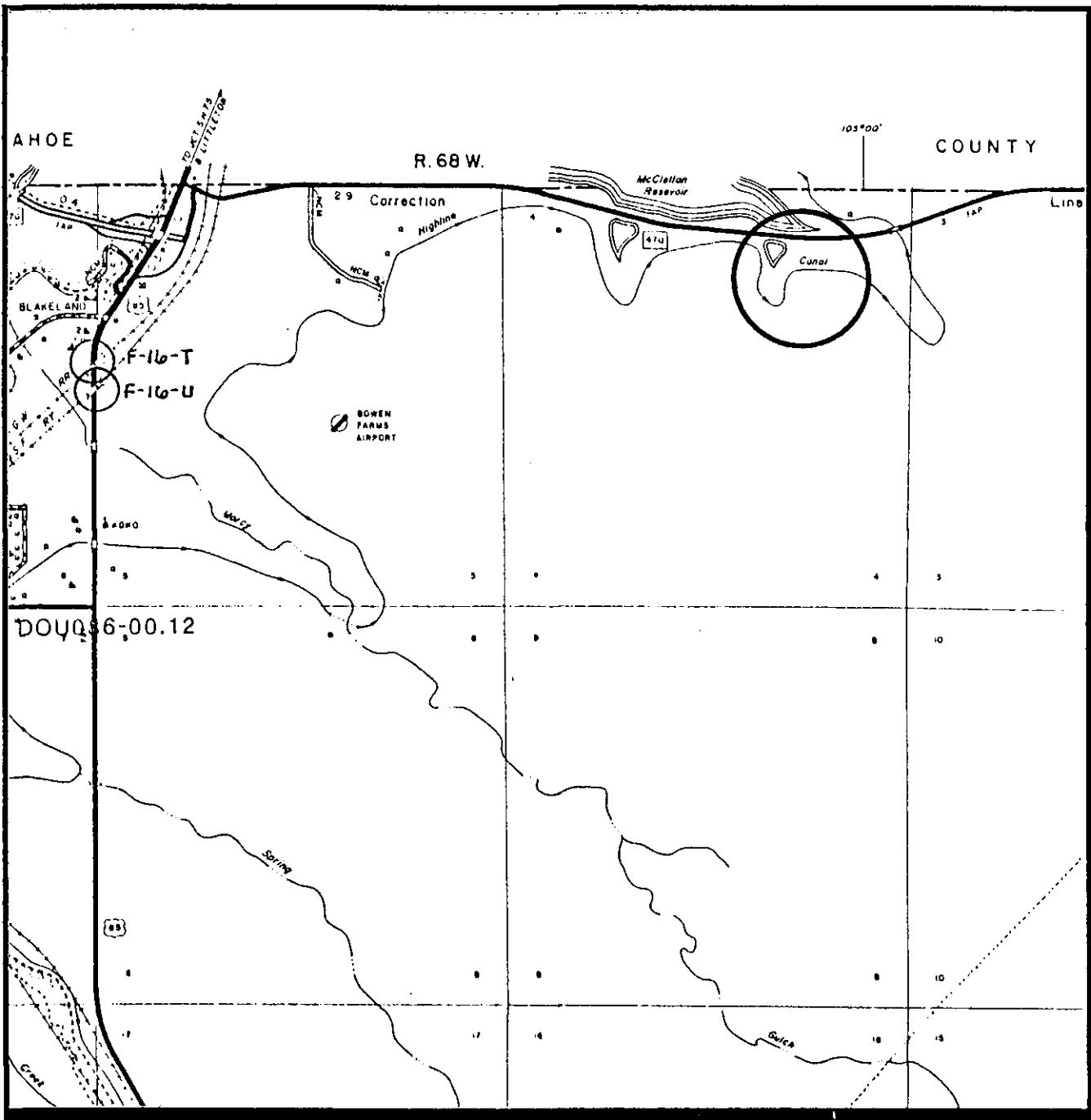


Figure 5. Location Map of McLellen Drive Interchange (Colorado Department of Transportation General Highway Map, Douglas County).